

## OBSERVATIONS AT HONOLULU.

The station is at 21° 18' N., 157° 50' W. It is the Hawaiian Weather Bureau station Punahou. (See fig. 2, No. 1, in the MONTHLY WEATHER REVIEW for July, 1902, page 365.) Hawaiian standard time is 10<sup>h</sup> 30<sup>m</sup> slow of Greenwich time. Honolulu local mean time is 10<sup>h</sup> 31<sup>m</sup> slow of Greenwich.

The pressure is corrected for temperature and reduced to sea level, and the gravity correction, -0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other. The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m., Greenwich time, on the respective dates.

The rain gauge, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet and the barometer 50 feet above sea level.

## Meteorological Observations at Honolulu, February, 1903.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m. Greenwich time, or 1:30 a. m. Honolulu time.										Total rainfall at 9 a. m., local time.	
				Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.				
				Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.			
		Dry bulb.	Wet bulb.												
1	*	↑	↑	74	69	↑	↑	ene.	5	2	30.18	30.08	0.01		
2	30.11	69	62.5	74	67	58.7	66	ne.	4-5	7	30.16	30.10	0.03		
3	30.12	70	63.5	74	67	59.5	68	ne.	4-5	7	30.16	30.04	0.00		
4	30.05	70	62.5	75	69	59.5	66	ne.	4-5	8	30.09	30.01	1.35		
5	30.03	68	64.5	75	69	60.0	70	ne.	4-5	8	30.16	30.01	0.40		
6	30.05	70	64	75	66	61.5	73	ne.	3-5	8-1	30.10	30.01	0.40		
7	30.14	70	63.5	75	67	60.5	73	ne.	5	6	30.19	30.05	0.45		
8	30.07	71	66	74	65	59.7	70	ne.	5	5	30.19	30.09	0.25		
9	29.99	63	62.3	76	68	64.5	80	ne.	3-0	4-1	30.11	29.99	0.00		
10	29.93	56	55	77	62	64.0	80	ws-w.	0-3	0	30.00	29.87	0.00		
11	29.88	55	53.5	72	56	52.3	72	n.	0	0-1	29.94	29.81	0.00		
12	29.90	54	53	73	53	55.0	79	n-w.	0-2	2	29.95	29.85	0.00		
13	30.00	64	61.5	73	53	55.7	79	w.	2-0	2	30.02	29.93	0.00		
14	30.06	66	57.5	74	61	58.3	72	w-n.	0-4	10-1	30.06	29.96	0.00		
15	30.10	65	57.5	72	65	49.3	55	nne.	4	10-4	30.14	30.05	0.00		
16	30.16	68	58.5	72	63	54.0	64	ne.	3-4	4	30.19	30.11	0.00		
17	30.14	65	61	74	65	54.7	62	ne.	3	5	30.21	30.14	0.00		
18	30.06	61	57	72	61	56.7	67	ne.	3	6	30.19	30.07	0.00		
19	29.86	61	56.5	74	59	50.7	62	sw-n.	1-0	9-0	30.08	29.87	0.00		
20	29.66	61	58	69	57	56.5	81	sw-w.	3-0	10-3	29.87	29.66	2.14		
21	29.85	68	63	70	54	59.5	84	nne.	4	9-6	29.88	29.66	0.60		
22	29.90	66	64	73	64	60.7	76	ne.	4	8	29.96	29.84	0.50		
23	29.92	59	53.5	73	63	61.0	82	ne-n.	3-0	9-1	29.95	29.86	0.01		
24	29.92	56	54	70	54	49.0	61	n-w.	2-4	5	29.95	29.85	0.02		
25	29.99	64	58	72	56	53.3	73	tw-n.	2-0	4	30.02	29.91	0.00		
26	29.95	61	59	72	56	55.7	71	n.	2	5	30.02	29.92	0.00		
27	30.00	63	59.5	73	61	54.3	68	nne.	3-0	1	30.05	29.93	0.00		
28	30.04	62	56.5	73	57	54.5	70	ne.	3	10-3	30.07	29.99	0.00		
29															
30															
31															
Sums														5.86	
Means	30.001	64.1	59.6	73.2	61.3	57.0	71.4		2.7	4.7	30.064	29.954			
Departure	+ .045					-5.5	-5.0				-0.2			+0.38	

Mean temperature for February, 1903, (6 + 2 + 9) ÷ 3 = 67.3; normal is 70.6. Mean pressure for February, 1903, (9 + 3) ÷ 2 = 30.003; normal is 29.958.

\* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4.31 p. m., Greenwich time. ‡ These values are the means of (6 + 9 + 2 + 9) ÷ 4. § Beaufort scale.

Maximum thermometer set at 9 p. m. and minimum at 2 p. m., local time.

## Mean temperature table.

Stations.	Elevation.	Mean max.	Mean min.	Cor. av'ge.
	<i>Feet.</i>	°	°	°
Pepeekeo	100	74.0	63.9	68.3
Waimea	2,730	69.2	52.3	60.0
Kohala	521	73.6	61.5	67.0
Nahiku	1,600	67.5	59.0	62.5
Waikoa	2,700	70.0	50.8	60.1
Ewa Mill	50	76.5	60.0	67.6
United States Magnetic Station	50	76.4	59.7	67.3
United States Experimental Station	350	73.8	62.2	67.5
W. R. Castle	60			66.8
Tantalus	1,725			
Hilo	40	76.6	62.0	68.6
Waikiki	15	73.1	63.8	68.0

Kohala, Bond, dew point, 58.4°; relative humidity, 73 per cent; Ewa Mill, 56° and 65; Magnetic Station, 57° and 71, same as Punahou.

As stated before, the month was the coldest on record, the dew-point also being the lowest. The marked disturbances of the month were about the 10th and 20th. Heavy surf, 1st-7th, 11th, and 21st. Snow on the 19th, 20th, and 23d. The first

fell as low down on the mountains, including Hualalai in Kona, as yet known, the previous recorded snowfalls on Mount Hualalai being in 1892 and 1863. Seven thousand feet elevation is about the lowest limit of snowfall on the Hawaiian mountains.

Electric storms on the 19th and 20th on Maui and Hawaii. Earthquakes, Hilo, 9th, 11:23 a. m., and 21st; Waimea, 4th, 10 p. m.; Kohala, 4th, 12:20 a. m.

The total rainfall at Nahiku, Maui, at 1600 feet elevation, for the twelve months from March 1, 1902, to February 28, 1903, 429.48 inches.

## CLIMATOLOGY OF COSTA RICA.

Communicated by H. PITTIER, Director, Physical Geographic Institute.  
[For tables see the last page of this REVIEW preceding the charts.]

*Notes on the weather.*—On the Pacific slope the weather was quite normal for the season; i. e., hot, dry, and windy. For San José pressure and temperature were slightly above the normals, while the hours of sunshine show a large excess. On the Atlantic slope rain was rather scarce and the coast stations report several squalls with a stormy sea.

*Earthquakes in San José.*—February 1, 9<sup>h</sup> 15<sup>m</sup> a. m., light shock E-W, intensity I, duration 3 seconds. February 2, 12<sup>h</sup> 33<sup>m</sup> p. m., light shock N-S, intensity II, duration 5 seconds. February 3, 6<sup>h</sup> 20<sup>m</sup> a. m., rather strong and well-felt shock N-S, intensity III, duration 4 seconds. February 10, 6<sup>h</sup> 07<sup>m</sup> a. m., strong shock E-W, intensity III, duration 10 seconds. February 11, 4<sup>h</sup> 49<sup>m</sup> a. m., slight shock E-W, intensity II, duration 4 seconds. February 22, 3<sup>h</sup> 05<sup>m</sup> p. m., strong shock E-W, intensity III, duration 8 seconds. February 24, 8<sup>h</sup> 22<sup>m</sup> p. m., light shock E-W, intensity II, duration 4 seconds; 10<sup>h</sup> 12<sup>m</sup> p. m., slight shock E-W, intensity III, duration 6 seconds. Another shock, strong and dilated, is reported from Cachi and Paraiso, having been felt same day, 24th, at about 4 a. m. February 25, 6<sup>h</sup> 06<sup>m</sup> a. m., well-felt shock E-W, intensity III, duration 6 seconds. February 28, 4<sup>h</sup> 09<sup>m</sup> a. m., dilated tremors E-W, intensity III, duration 38 seconds; generally felt, frightening people. The same earthquake is officially reported from San Isidro de Alajuela.

## THE TEMPERATURE AND RAINFALL DEPARTURES AT HAWAII, AS DUPLICATED IN NEW ENGLAND SIXTY DAYS LATER.

By ALTON D. ELMER, Northfield, Mass., dated February 11, 1903.

When the MONTHLY WEATHER REVIEW began publishing Curtis J. Lyons's Hawaiian observations it was said to be done for the benefit of those who wished to study for long-range seasonal predictions. I, therefore, inclose a copy (unverified for clerical errors) of some comparisons which I have just made, only extending them until I detected a correlation between the Honolulu monthly temperatures and those of New England two months later.

Table 1 shows that changes in the departures from monthly normals of rainfall in Honolulu are followed by corresponding changes in New England sixty days later, in a majority of cases, and the same holds good for the temperature departures.

Attention is called to the fact that the 60-day period, not only for precipitation but also for temperature, is much more marked as the records progress, thus confirming a suspicion that the whole difficulty in the earlier records was the want of good normals.

During 1902, rising or falling monthly temperatures at Hawaii were followed by increased or decreased precipitation in New England two months later, with the exception of but one and one-half months. The year 1902 was likewise remarkable in New England for having increased temperature accompany increased precipitation and decreased temperature accompany decreased precipitation every month but one. This is explanatory of the cold summer, corrected by a warm spring and a

warm fall. Carrying comparisons back to 1898 shows that predictions of rainfall and temperature in New England can sometimes be made from the preceding temperature of Honolulu. But it is interesting to observe that when this 60-day rule does not apply, the temperature at Honolulu is followed sixty days later by a similar temperature in New England 14 times out of 18 in the four years or 78 per cent. Excluding four months of comparisons, affected by uncertain normals, 31 out of 44 or 70 per cent of months of observed temperature at Honolulu were followed two months later by similar changes in New England.

TABLE 1.—Departures from monthly normals in Honolulu.

Year and month.	Rainfall departures.		Temperature departures.	
	Honolulu.	New England.	Honolulu.	New England.
<b>1898.</b>				
May	.....	+ 0.49	.....	— 0.9
June	+ 1.34	— 0.20	— 1.5	— 0.7
July	.....	+ 0.52	.....	+ 1.2
August	.....	+ 1.62	.....	+ 2.7
September	.....	— 0.36	— 0.1	+ 2.6
October	.....	+ 2.78	— 0.3	+ 2.6
November	— 4.20	+ 1.82	+ 1.1	0.0
December	.....	— 1.08	— 1.0	— 1.3
<b>1899.</b>				
January	— 2.05	— 0.29	+ 0.4	+ 0.6
February	— 1.00	+ 0.30	+ 1.6	— 2.0
March	+ 0.78	+ 2.91	+ 0.5	— 1.1
April	— 1.94	— 1.33	— 0.1	+ 1.0
May	— 0.50	— 2.01	0.0	+ 0.4
June	— 0.40	0.00	— 0.8	+ 1.5
July	— 1.60	0.00	— 0.3	0.0
August	— 0.50	— 2.26	— 0.3	+ 0.3
September	— 1.35	+ 1.40	— 0.2	— 1.4
October	+ 1.36	— 1.67	— 0.6	+ 3.1
November	— 4.85	— 1.76	— 0.3	0.0
December	— 2.91	— 1.41	+ 0.6	+ 2.7
<b>1900.</b>				
January	— 2.46	+ 0.71	+ 0.4	+ 2.1
February	— 4.86	+ 3.69	— 0.1	+ 0.2
March	— 1.60	+ 1.65	+ 1.2	— 3.2
April	+ 2.24	— 1.19	0.0	— 1.2
May	— 1.40	+ 0.24	+ 0.7	— 2.2
June	— 0.72	— 0.14	+ 1.7	+ 0.8
July	+ 0.79	— 1.64	+ 1.3	+ 1.7
August	.....	— 1.42	+ 1.3	+ 2.0
September	— 0.50	— 1.30	+ 0.9	+ 2.3
October	+ 4.42	0.00	+ 0.6	+ 5.8
November	+ 5.78	+ 1.57	+ 0.3	+ 2.9
December	— 3.00	— 1.24	+ 0.1	— 1.7
<b>1901.</b>				
January	— 0.10	— 1.64	+ 1.2	0.0
February	+ 2.00	— 2.48	— 1.7	— 5.1
March	+ 0.82	+ 1.91	+ 1.0	+ 0.5
April	+ 0.30	+ 3.85	+ 0.2	— 1.0
May	+ 0.23	+ 2.03	+ 0.6	— 0.7
June	— 0.10	— 0.91	+ 1.5	+ 0.9
July	— 0.27	— 0.43	+ 0.5	+ 2.6
August	— 1.09	+ 1.66	+ 1.1	+ 1.7
September	— 1.19	— 0.97	— 0.3	+ 1.3
October	+ 1.68	— 0.64	— 0.5	+ 1.7
November	+ 1.68	— 1.72	— 0.5	— 4.4
December	+ 6.06	+ 4.08	+ 0.1	— 0.8
<b>1902.</b>				
January	— 2.80	— 1.48	+ 0.7	— 0.6
February	— 4.45	+ 0.33	— 0.9	+ 0.7
March	+ 7.96	+ 2.35	0.0	+ 7.8
April	.....	+ 0.66	— 1.0	+ 2.0
May	— 1.34	— 1.17	— 0.8	— 1.2
June	— 0.33	— 1.42	— 0.2	— 3.6
July	+ 1.07	— 0.77	+ 0.5	— 2.5
August	— 0.24	— 0.62	+ 0.8	— 2.3
September	+ 0.29	+ 2.15	— 0.1	+ 1.3
October	— 0.17	+ 1.35	— 0.6	+ 1.3
November	+ 4.65	— 0.93	— 0.5	+ 4.8
December	.....	.....	.....	.....

It would seem, therefore, that there is a certain interval between Hawaii and New England by which monthly climatological predictions may be approximated to a considerable degree of accuracy.

NOTE.—The above table is as given by Mr. Elmer without being revised by the Editor. If the rainfall had been expressed as percentages of the normal annual amounts and the temperatures had been expressed as percentages of the normal annual fall at the respective stations, the comparison would have been even more interesting. Any improvement or change in the adopted monthly normals will change the positive and negative signs, and also the above rule as given by Mr. Elmer.

His conclusions, therefore, may not be confirmed by further investigation, but some definite geographic correlation of value may result.—Ed.

#### SOME HIGH WIND RECORDS ON THE PACIFIC COAST.

By Prof. ALEXANDER G. MCADIE and Mr. W. W. THOMAS, Observer, United States Weather Bureau, dated May 27, 1902.

At the beginning of the year 1902 a new Weather Bureau station at Point Reyes Light was completed. The station is located in latitude  $38^{\circ} 12'$  north, longitude  $122^{\circ} 51'$  west of Greenwich. The station at this point was originally in rooms of the United States Light-House Building, upper southwest corner, and the records go back to October 9, 1888. The first observation in the present office was on January 17, 1902. The elevation of the new building is 490 feet above sea level. The height of the anemometer cups above the ground is 30 feet. On February 23, 24, and 25, 1902, a severe southeast disturbance prevailed along the coast of California. This was the first pronounced disturbance to which the new station had been subjected. The following extracts from the Daily Journal at Point Reyes Light by the Observer, Mr. W. W. Thomas, tell the story of the weather conditions at that time:

*February 23, 1902.*—A southeast storm began during the night with light rain and a 70-mile wind; the storm continued throughout the day showing no abatement at nightfall. A maximum of 80 miles from the southeast was recorded at 1:30 p. m., and this velocity was reached frequently during the afternoon. Order to hoist southeast storm warnings received 12 noon. Line down since 12 noon. No communication east.

*February 25, 1902.*—The day opened with light rain and a terrific southeast storm in progress; wind increased rapidly to 90 miles an hour at 10:15 a. m. and continued at that velocity until after 12 noon, very frequently reaching velocities of 98 to 100 miles an hour. A maximum of 98 miles during five consecutive minutes occurred 11:15 a. m., at which time an extreme velocity of 103 miles was recorded—a mile in 35 seconds. The wind began to veer to the west and to lose its force soon after noon; clearing conditions began and at 2 p. m. the weather was practically clear, with a fresh southwest wind. About 3 p. m. the clouds began to increase rapidly and during the evening threatening weather prevailed with brisk southwest wind.

Distant lightning was observed in the northwest between 11 and 12 p. m., and later information showed that distant thunder and lightning occurred in the northwest frequently throughout the night.

Since the passage of this storm the weather has reached a normal condition.

During all this terrific wind the anemometer worked magnificently and none of the instruments were damaged in the least.

On March 1 another severe southeast disturbance prevailed off this section of the Pacific coast. At San Francisco the wind changed from southeast at 9 p. m., seventy-fifth meridian time, blowing from the south for about 28 minutes and then from the southwest, reaching a maximum velocity a little after 10 p. m. of 60 miles and an extreme velocity at 10:12 p. m. of 75 miles. At Point Reyes Light the maximum velocity occurred at 9:45 p. m., when 10 miles were recorded in a trifle over five minutes. The observer states in a letter "that for a half hour prior to this time he checked off the 10-mile spaces as they occurred, timing the miles with his watch. One mile was completed in slightly less than thirty seconds; and for five minutes, including the time of the extreme velocity, the miles averaged a small fraction less than thirty-three and one-half seconds." This is at the rate of 107 miles per hour. The following brief report of the storm was written by the observer, Mr. W. W. Thomas:

The day opened with cloudy, threatening weather and light wind varying in direction from southeast to northeast. Light rain began at 7:45 a. m., local time; wind continued light to fresh, northeast to southeast until noon, when it began blowing steadily from the southeast and to increase in force to about 45 miles an hour. At 3:30 p. m. it increased suddenly to a little more than 70 miles an hour. Light rain ended at 5:35 p. m. and at 5:55 p. m. a rainbow was observed. About 5:30 p. m. the wind began to veer to the westward and to increase rapidly in force. At 6:45 p. m. a maximum of 108 miles was recorded from southwest. Wind continued to veer to west and northwest, still continuing at about 100 miles an hour until 9 p. m., local time.

Our flagstaff (wooden) blew down at 6:45 p. m. and the receiver of the rain gage blew away and has not been found.